

NAME P/N QTY	CRIT	FAILURE MODE & CAUSES	FAILURE EFFECT	RATIONALE FOR ACCEPTANCE
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141FM02				
GAS TRAP, ITEM 141 2/2 ----- SV784943-5 (1)		Restricted flow, hydrophilic screen clogs.	END ITEM: Reduction in coolant flow to the LCVG and sublimator.	A. Design - P/Ns SV784943 and SV805257: The surface area of the screen is sized not to clog during a mission due to the known contaminant level. Screen is replaced periodically per the Limited Life List.
OR				
----- SV805257-2 (1)		Contamination in the coolant loop.	GFE INTERFACE: Reduction in LCVG cooling capability.	The gas trap hydrophilic screen mesh size was chosen to provide the desired system bubble point pressure, while the total open area was sized to allow for a fifteen year life at an estimated clogging rate. The original estimates of clogging rate have proven to be unrealistic as development history indicates the filter must be cleaned after 112 hours for P/N SV784943 and 188 hours for P/N 805257.
			MISSION: Terminate EVA. Vent loop available for defog.	B. Test - Component Acceptance: P/Ns SV784943 and SV805257: A screen pressure drop test is performed by supplying a flow of 260-280 lbs/hr at a temp of 60-80 degree F. The pressure drop across the screen as a function of inlet H2O temperature must not exceed a specified amount, depending on temperature approx. .11-.15 inches of H2O max for P/N SV784943 and approx. .80-.87 inches of H2O max for P/N SV805257.
			CREW/VEHICLE: None.	A bubble point performance test is performed by submerging the wetted item 0.35-0.65 inches below the surface of alcohol and measuring the inlet pressure at which point 100% bubbling occurs.
			TIME TO EFFECT /ACTIONS: Minutes.	100% bubbling shall occur at 12.0" H2O max.
			TIME AVAILABLE: N/A	The item is performance tested by supplying the inlet with a mixture of H2O and N2 at the rates of 195-205 lbs/hr H2O and 502-695 scc/min N2 at an inlet pressure of 10.8-10.9 psid. The item must completely separate the gas from the H2O i.e. gas flow out must be within 10% of 502-695 scc/min N2 and there must be no entrained gas in the water outlet.
			TIME REQUIRED: N/A	The item is additionally performance tested as per above except the H2O/N2 mixture is 195-205 lbs/hr H2O and 502-695 scc/min with N2 at a pressure of 5.8-5.9 psid. Gas flow out must be within 10% of 502-695 scc/min N2 and there must be no entrained gas in the water outlet.
			REDUNDANCY SCREENS: A-N/A B-N/A C-N/A	PDA: P/Ns SV784943 and SV805257: Test fixtures and interfacing hoses are cleaned to HS3150 level EM150. The H2O circuit of the rigs are cleaned to HS4150 level EM50. These cleanliness levels are maintained for component testing also.
				No test is done at the PDA level that directly addresses that the gas trap screen is clogged, but if the gas trap were clogged then it would be detected at fan/pump performance. With the system charged and a flow of 187 lb/hr H2O minimum through the water cooling circuit the pressure across the pump shall be 4.67 psid minimum, as measured at ports T4 and T7 (gas trap inlet and sublimator outlet). Ports T5 and T6 are connected.
				Certification: Certified for a useful life of 112 hours (ref. EMUM-583).

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		141FM02		<p>P/N SV805257 Certified for a useful life of 188 hours (ref. EMUM-680).</p> <p>C. Inspection - P/Ns SV784943 and SV805257: The screen is visually inspected for cleanliness at visual inspection of the gas trap assembly during final cleaning per HS3150 EMI50B prior to delivery to finished stores.</p> <p>D. Failure History - (Old Design: P/N SV784943) J-EMU-100-C023 (3/20/80) and H-EMU-100-C026 (8/8/80) - Gas Trap, was plugged with aluminum oxide causing low cooling loop flow. The valve module has been changed to stainless steel and other material changes have been made to prevent aluminum oxide from getting into the water loops.</p> <p>J-EMU-000-004 (2/28/81) - Gas Trap was clogged by Phthylate Ester from Tygon Tubing in LCVG. LCVG tubing was changed to EVA material to eliminate source of contamination.</p> <p>H-EMU-141-D005 (3/23/87) - Gas trap was overhauled and subsequently failed screen pressure drop acceptance test. CRM op sheets revised to implement cartridge replacement to eliminate cartridge cleaning since it is difficult to verify cleanliness of used cartridges.</p> <p>I-EMU-102-A008 (01/04/99) - Item failed water line circuit pressure drop test due to trapped air in the water lines. Act: 1.0 psid. Spec: .8 psid max. Test panel circulating pump heats water quickly. In order to maintain test water temperature requirements of 60 +/- 5 deg. F., pressure reading had to be taken before water temperature rose, which didn't allow technician time to flush all air from water lines. The Feedwater Fill and Drain Line pressure drop design and test requirements also had 60 +/- 5 deg. F. water temperature requirements. The water temperature requirement has been changed to 90 deg. F. max for all of these tests. Ref. CCBD H6921.</p> <p>P/N SV805257:</p> <p>H-EMU-141-A003 (3/3/99) - Item failed to achieve 100% bubbling during acceptance test. Act: 50% bubbling achieved. Supplier tested same cartridge at 100% bubble testing by pre-setting the pressure at 11.97 inches of water (Max spec: 12.0 H2O). At HS, the failure occurred at 10.6 inches of water. Increasing the pressure closer to the max spec agitated the IPA bath, making it difficult to determine 100% bubbling. Additionally, rollers used at the manufacturer to compress the raw screen stock to make the screen openings more uniform were uneven, and applied unequal compressive forces to the raw screen stock which could affect bubble point performance. E.C. 182135-298 changes the design specification for the 141 Gas trap (SVHS10076) to ensure the pressure at which 100% bubbling occurs is recorded for each item tested, eliminating supplier's practice of using a "set point" at or near max spec. Rollers on the manufacturer's machine were modified</p>

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		141FM02		<p>to increase their diameter and roller surfaces are periodically dressed to produce a more consistent uniform screen and mesh, and, subsequently, a more uniform bubble point.</p> <p>E. Ground Turnaround - Tested for non-EET processing per FEMU-R-001, Fan/Pump/Separator/Vent Flow Sensor Performance. None for EET processing.</p> <p>F. Operational Use - P/Ns SV784943 and SV805257: Crew response - Pre-EVA: Trouble shoot problem. If no success, consider 3rd EMU if available. EMU is go for SCU. EVA: Diminish intensity of activity. Try to stay away from direct sunlight. If cooling inadequate, terminate EVA. Training - Standard training covers this failure mode. Operation Considerations - Flight rules define loss of EMU for loss of thermal control. RTDS allows ground monitoring of EMU system. EVA check list procedures verify hardware integrity and systems operational status prior to EVA. Flight rules define EMU as go to remain on SCU (available for rescue if required).</p>

EXTRAVEHICULAR MOBILITY UNIT  
SYSTEMS SAFETY REVIEW PANEL REVIEW  
FOR THE  
I-141 GAS TRAP  
CRITICAL ITEM LIST (CIL)

EMU CONTRACT NO. NAS 9-97150

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